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Alternating spin-orbital order in tetragonal Sr 2VO 4

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Abstract

Considering spin-orbit coupling, the tetragonal crystal field, and all relevant superexchange processes including quantum interference, we derive expressions for the energy levels of the vanadium ions in tetragonal Sr 2VO 4. The used parameters of the model Hamiltonian allow us to describe well the excitation spectra observed in neutron scattering and optical experiments at low temperatures. The free energy exhibits a minimum which corresponds to a novel alternating spin-orbital order with strong thermal fluctuation of the orbital mixing parameter.

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